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ABSTRACT

Emerging literacy is a developmental process which is closely tied to the child's developing cognitive processes. The interaction of memory and emerging literacy can be discussed in the context of Marie Clay's Reading Recovery model. Memory types, encoding and retrieval, strategy use, and executive control/expectancies are components of cognitive processing that broadens educators' conceptualization of early literacy acquisition by looking at emerging literacy from a different perspective. Three types of memory have been identified: recognition, reconstruction, and recall. From short term memory to long term memory, the most critical of transformations occurs--encoding. Strategies (the third area of memory) are conscious activities that a learner uses to facilitate memory. In the information-processing model, executive control directs the learner's attention, decides on how information is encoded and retrieved, and how information is expressed in organized responses. Understanding memory's role in early literacy acquisition deepens the researchers' and teachers' knowledge of factors that may impact how children learn to read. This knowledge can expand the understanding of how to support each child's literacy development as she journeys from recognition memory to recall memory, develops metamemory, and replaces less efficient strategies with more efficient strategies. (Contains 27 references.) (RS)

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THE ROLE OF MEMORY IN EARLY LITERACY ACQUISITION

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Learning to read is a complex process (Clay, 1985). This theoretical paper investigates just one aspect of cognitive functioning, memory, which facilitates reading. From an information-processing model, memory stands out as the primary component of the cognitive processes (Gagne, 1985). Knowledge a child constructs as she adapts to her environment is stored in and retrieved from memory (Piaget, 1952, 1962). Since early literacy acquisition involves the cognitive processes of memory, investigating how memory interacts with a child's emerging literacy is important for both researchers investigating the process and for teachers nurturing the process. Thus, this paper examines the role of memory in early literacy acquisition. The interaction of memory and emerging literacy is discussed in the context of Marie Clay's Reading Recovery model (Clay, 1985). How memory interacts with the program and process is evaluated in terms of assessment, daily instruction and strategy development. Specifically, four areas of memory are addressed: memory types, encoding/retrieval, strategy use, and executive control/expectancy.

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Memory Types. Three types of memory have been identified. These are recognition, reconstruction, and recall. Recognition memory is the ability to recognize (acknowledge) information that

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has been previously attended to. It relies on perception and sensorimotor schemes alone. Reconstruction memory is the ability to recognize previously attended to information when one is permitted to reconstruct the context in which the information is given. It is an intermediate form of regeneration in that the child sees the elements of the model without having to recall them. Recall memory is the ability to call back (retrieve) stored information from memory. It requires mental imagery or language, some form of symbolic function.

In a contempory example, students like multiple choice exams because they just have to "recognize" the correct answer. However, essay questions place greater demands on memory, because now the students have to "recall" the correct information. If students are given a schema that they must put together correctly, they would be using reconstruction memory. Reconstruction memory is like putting a puzzle together. One does not have to recall the complete picture, but one needs to recognize the pieces that complete the picture. The pieces are used to support one reaching the goal.

Piaget suggests that a progression exists from recognition memory to recall memory. Recognition memory is easier than reconstruction memory and reconstruction memory is easier than recall memory. Recall memory is the highest form of memory.

What role do the three types of memory play in early literacy acquisition? In Marie Clay's Reading Recovery model, one of the most important components in the process of nurturing literacy is to first assess the child's literacy development. In so doing, the

teacher can begin with the child's knowledge base, building on her successes. Understanding the progression of recognition memory (easiest) to recall memory (hardest), can enlighten the literacy assessor to an area of success (knowledge) often overlooked.

Marie Clay uses several instruments to assess early literacy development (i.e. letter identification, vocabulary test, sentence dictation, concepts of print).

For letter identification, the assessor asks the child for recall memory of letters. He points to each letter on a chart and asks, "What is this letter?" The child must "recall" the name or sound. However, the assessor misses an important step in the child's developing knowledge of the alphabet by not focusing on recognition memory. In letter identification, for example, a child will recognize letters before recalling them. If the assessor asks the child to find the letter A on the chart, she may be able to point to it quickly, thus recognizing it, but yet unable to recall the name from memory.

Similarly, a child may verbally know (rote memorization) her alphabet and "reconstruct" the letter names using her verbal knowledge of the alphabet. Again, this is a transitional memory step to recall memory. Understanding the progression of memory for the alphabet is important to fully note the child's strengths and document her progress. The knowledgeable teacher can then nurture recognition memory of letters to recall memory. At that point, the child moves from "I can recognize it, but I can't recall it" to "I can recall it." The letter has been securely constructed by the

child in memory.

Both the vocabulary test and sentence dictation test require the child to use recall memory. These instruments are much more difficult for the emerging reader/writer. In the vocabulary test, the child must write as many words as she can spelled correctly. The child must also read each word back correctly to receive credit for the word. What the child recalls may be by sight or by reconstruction of the word by using sound/symbol relationships. In sentence dictation, the child must write the sounds she hears in the dictated sentences. The child must recognize the sounds and then recall what letters match the sounds she hears. In either instance, the tasks do not involve mere recognition memory, rather higher forms of memory.

The assessor knows that what the child records in these two assessments are secure knowledge in recall. This is an important step in the child's memory progression as well as literacy development and should be so noted. Understanding the development of memory which moves from the easiest (recognition) to the most difficult (recall) helps focus the teacher's attention on additional strengths the child has as well as enlightens the teacher to useful strategies that support this development. Clay does suggest some strategies to help children remember such as using the child's own associations such as L for lion or B for bear; arranging for repetition; arranging for overlearning; using games; and developing strategies to study words. However, the teacher must keep in mind that the child may be in the beginning

stages of memory development for each item of new information and that cognitive development is an individual construction; some children may take longer to construct certain information than others.

Encoding and Retrieval. The second area of memory to be discussed is encoding and retrieval. From short term memory to long term memory, the most critical of transformations occurs. This process is called encoding. One form of encoding is into meaningful propositions. New information encoded into a context of meaning will be remembered more easily than if it is simply memorized. New information embedded into a preexisting context (structure of knowledge) is also easier for the learner to remember than for a learner with a small amount of prior knowledge (Gagne, 1985). Other types of encoding include visual imagery and topical organization.

Once information is semantically encoded, it is stored in this form in long-term memory. Processes of search and retrieval are instituted in long-term memory. The cues for search in long-term memory are "linked" or matched to what is learned. When information is "recognized" it may be retrieved. According to Piaget, memory storage is "construction" and retrieval is "reconstruction."

For the emerging reader, the story becomes a meaningful proposition in which new information is encoded. The story is a memory schemata which organizes and guides the incoming information. Clay supports the concept that "one learns to read by

reading." When the process of reading is embedded in a meaningful context, the child can semantically encode as well as practice and invent strategies necessary to be an independent reader. Semantically-encoded information facilitates recall, the highest form of memory.

When a young child begins the process of "reading" in the sense of "learning how to mean" (Halliday, 1975), she uses the story to reconstruct the reading process. She may recognize that the print contains meaning but not attend to the print. Recalling the story is easier than recalling the words (actually reading the text).

The book introduction is an excellent teacher strategy to make the text more accessible to the beginning reader. Before a first read, the teacher will discuss pictures, new words, and strategies. He will help the child establish cues to help her remember certain letters or words. The teacher focuses the child's attention on parts of a text embedded in a meaningful context. In so doing, the teacher activates recognition and reconstruction memory for the child and prepares the child to use these as beginning strategies to support reading.

For example, an emergent reader will recognize and reconstruct the story using picture clues. The child uses a picture of a lion to read the words "a lion". She sees a bear and reads "a bear". With a focused book introduction, the child may begin to associate the printed L with lion and the printed B with bear. In the process of learning to read by reading, the child will use all

three forms of memory to support her encoding the reading process within the meaningful context of the story. The child will use picture clues, story, meaning, structure (syntax), and visual graphics to retrieve (reconstruct) the text.

Knowing how children use memory helps educators and researchers understand why a child may be an independent reader in certain texts but not in other texts (i.e. basals), and how a child may be an independent reader when working one-to-one but not in a classroom setting. On a one-to-one instructional basis with a book introduction, a child may be reading with picture clues and familiar text to support his memory for text, thus reading at an independent level. However, the same child in a classroom setting may read the same level of text at the frustrational level. The child does not have the memory or strategy supports to facilitate his reading. In the physical world, a child will first learn to walk by holding onto someone's hands or onto furniture, until she is strong enough to walk alone. Likewise, in the cognitive world, picture clues and story, for example, will be external cues to support emerging reading. The child uses these supports until the reading process is secure.

Strategies. The third area of memory is strategies. Strategies are conscious activities that a learner uses to facilitate memory (Flavell, 1977). Learners use cognitive strategies to encode.

Wood (1988) suggests that children under age eight do not utilize certain strategies. Wellman, Ritter, and Flavell (1975)

found that young children (ages 3 to 4) do engage in simple memory strategies when instructed to remember, but do not when given incidental instructions. Vogel (1979) found that five- and six-year-olds showed little evidence of spontaneous use of memorization strategies, but were able to use them when given specific instructions. However, he found that these strategies are rarely maintained when no longer prompted to do so.

Baker-Ward, Ornstein, and Holden (1984) suggest that the "acquistion of memory strategies represent a gradual and lengthy process" (p. 574). Not only is strategy use developmental, but as Fabricius and Wellman (1983) propose, strategy development accounts for most of memory development. They suggest that memory differences among different ages of children is due in large part to how they use their brains, rather than fundamental differences in their brains themselves.

Fabricius and Wellman (1983) suggest four general principles of strategy development: a) strategy acquisition occurs over time; b) younger children can be trained to use strategies that are spontaneously used by older children; c) strategy training can increase memory performance; and d) children often fail to maintain and generalize trained strategies.

As Clay (1985) notes, strategy development is a crucial component to successful independent reading. "The high progress reader," Clay says, "after one year of instruction, operates on print in an integrated way in search of meaning, and reads with high accuracy and high self-correction rates . . . He also has

several ways of functioning according to the difficulty level of the material. Where he cannot grasp the meaning with higher level strategies he can engage a lower gear and use another strategy such as knowledge of letter clusters or letter-sound associations, but manages to maintain a focus on the messages of the text. On the other hand, the low progress reader or reader at risk tends to operate on a narrow range of strategies" (p. 7).

Fabricius and Wellman (1983) note that most children acquire strategies without explicit instruction. The children choose strategies or "invent" strategies which are helpful or adapt strategies to new tasks. As children develop, strategy acquisition may be more acurately described as strategy replacement. The child finds more efficient strategies to replace less efficient ones. Flavell (1977) suggests that little is known about the spontaneous beginnings of memory strategies and retrieval efforts of young children. Age differences are noted. Older children are more sensitive to using memory strategies than the younger children. But, Flavell notes that both younger and older children favor external memory aids to unaided internal memory.

Miller (1983) suggests that acquisition of appropriate strategies underlies developmental changes in memory. Flavell (1977) suggests that young children have the strategies but are deficient in knowing when, where, and how to use them effectively. As a child matures, he makes greater use of memory strategies, picking strategies to fit the task. Miller (1983) also suggests that children increase their understanding of memory as they

mature. Deficiencies in memory strategies may be cause by poorly developed metamemory. Even though a child is "given" the knowledge of strategy use, if he does not "own" the knowledge, he will not use the strategies. He has not developed spontaneously his strategies for memory or reading.

As noted, good readers use a high range of strategies, and at risk readers use a narrow range of strategies. For those working with emergent readers, the research on memory strategies has important implications for the reading process. First, some young readers do not spontaneously use the sophisticated strategies of good readers. They can be trained to use strategies such as "Say the beginning sound then read to the end," but when someone is not present to remind them to use the strategies, they revert back to less efficient strategies. These children do not "own" the strategies for themselves. Understanding strategy use can help the frustrated teacher understand why the child uses the strategies effectively one-to-one, but does not use strategies independently in the classroom.

Understanding the developmental nature of strategy use will also help the teacher to see the emerging strategies in which the child is already engaged and then he can support and nurture more sophisticated strategy use through "scaffolding" (Vygotsky, 1976).

Acceleration is a Reading Recovery component that can be used successfully to encourage children to take the initiative to be active participants in the process of becoming independent readers. The observant specialist knows when to increase support and when to

minimize support. Minimal support at appropriate times increases the child's "work" on constructing her reading strategies and knowledge of the process. However, the knowledgeable specialist must also realize that the developmental process of strategy use is a "gradual and lengthy" process and he must give each child time to develop strategies and replace less efficient strategies with more efficient ones. He needs to balance acceleration with realistic expectations.

Executive Control/Expectancies. The last area of memory to be addressed is Executive Control and Expectancies. In the information-processing model, executive control directs the learner's attention, decides on how information is encoded and retrieved, and how information is expressed in organized responses (Gagne, 1985). Executive control processes may be described as self-management behaviors.

Cognitive strategies are regulated by executive control. Clay (1985) uses the word "strategy" to note "mental activities initiated by the child to get messages from the text" (p. 14). She sees the end point of early instruction as when the children have reached a self-improving system. This system fits under "executive control." Clay describes the self-improving process as follows:

". . .when children have a self-improving system . . . they use a set of operations or strategies 'in their heads' which are just adequate for reading the more difficult bits of the text. In the process they engage in 'reading work', a deliberate effort to solve new problems with familiar information and procedures. They

notice new things about words, and constructively link these things to both their knowledge of the world around them, and to their knowledge of the printed language gained in their short history of successful reading of simple books. The process is progressive and accumulative" (p. 14).

As Clay notes, this processs is progressive and accumulative. She suggests that the task of the "reading recovery programme is to get the child to use any and all of the strategies and operations that are necessary to read texts of a given level of difficulty... Using strategies will lead the reader to the assimilation of new items of knowledge. Strategies for thinking about printed language are an important part of a self-improving system" (p. 14).

The reading specialist models and supports self-monitoring strategies. He allows room for self-correction to be initiated by the child. He prompts the child with questions to confirm her responses by asking questions such as "Does it look right, sound right or make sense?" He encourages cross-checking for structure, sound or visual cues. And, most importantly, he reinforces the child for her self-monitoring whether the attempts are successful or not. He creates a "risk-free" learning environment.

A child who is having difficulty using a self-improving system may have a "production deficiency" involving the child's metamemory (Fabricius and Wellman, 1983). Metamemory is one's knowledge about memory. Flavell (1977) suggests that "the growing child becomes increasingly realistic and accurate in assessing his own memory capabilities . . . he becomes better able to monitor and interpret

his immediate memory experiences and states, e. g., feel or sense that something he cannot now recall is nonetheless in memory and therefore would be recognized if encountered" (p. 218). Fabricius and Wellman (1983) suggest that the child may not think to use a strategy "because the person's knowledge about memory (metamemory) does not include that particular strategic activity as a useful or relevant activity for the particular materials and task at hand" (p. 180). Again, the knowledgeable specialist can continue to support the child's self-improving system, yet know that metamemory is developmental and in time the child will be able to monitor his own reading.

While the results of Reading Recovery are impressive, one must note that some children do not maintain the progress back in the classroom. Clay (1985) admits that "some children made slow progress for a year and then accelerated again while other children began to lag in progress after two years" (p. 83). With the support of one-to-one instruction, a child may continue to grow, however some children leave the program before strategy use is secure and metamemory is developed. The children have not failed, but their developmental process may not be complete given the nature of young children. They are still using the "supports" and cannot "walk" alone. We must be careful not to abandon these children, but to continue to support them until their knowledge is securely constructed as their own.

Expectancies is a subclass of executive control. Gagne (1985) notes that expectancies "represent the specific motivation of

learners to reach the goal of learning that has been set for them or that they have set for themselves" (p. 78). Motivation is an affect component crucial to memory and the cognitive processes. Bower (1981) investigated the influence of emotion on memory and found that "emotion serves as a memory unit . . . activation of this emotion unit aids retrieval of events associated with it" (p. 127).

Expectancies underlies the entire literacy process. Clay addresses the affect component of motivation by always working from the child's successes instead of failures. Where failure discourages, success encourages. Children, motivated by success, will reach for the goal of literacy.

Emerging literacy is a developmental process which is closely tied to the child's developing cognitive processes. Memory types, encoding and retrieval, strategy use, and executive control/expectancies are components of cognitive processing that broaden our conceptualization of early literacy acquisition by looking at emerging literacy from a different perspective. Understanding memory's role in early literacy acquisition deepens the researcher's and teacher's knowledge of factors that may impact how children learn to read. This knowledge can expand our understanding of how to support each child's literacy development as she journeys from recognition memory to recall memory, develops metamemory, and replaces less efficient strategies with more efficient strategies.

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